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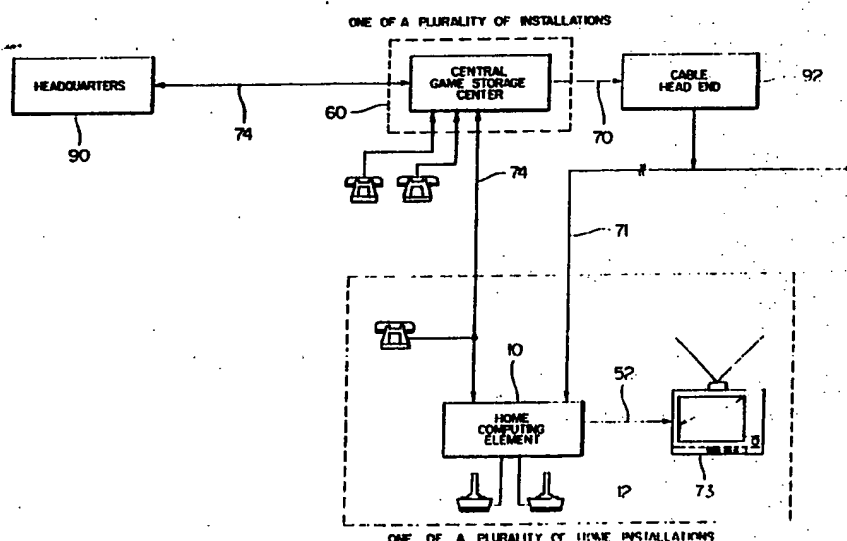
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(54) Title: TELEPHONE ACCESS VIDEO GAME DISTRIBUTION CENTER



(57) Abstract

A digital, interactive communication system designed to provide a plurality of remote subscribers with any one of a plurality of stored video games or like software packages through the use of a home computing assembly (10) maintained within the subscriber's home and structured to display video as well as generating audio on a standard television receiver (73) and further incorporating the ability to utilize contemporary video gaming control devices (12) for subscriber program interaction. A bidirectional communication link (74) is established over the telephone lines between the home computing assembly (10) and the central remote game storage center (60) wherein the software programs are transmitted as a modulated carrier to the subscriber. Program selection is controlled by a remote game storage center executive software program. Automatic billing is performed by computing equipment maintained in the remote game storage center and transmitted to a headquarters (90) which also receives diagnostic messages associated with the remote game center and/or the associated plurality of home computing elements.

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TELEPHONE ACCESS VIDEO GAME
DISTRIBUTION CENTER
BACKGROUND OF THE INVENTION

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2
3
4 This invention relates to a home computing element
5 capable of establishing a digital, interactive communications
6 system providing a plurality of subscribers access to a
7 plurality of video games stored in a plurality of remote game
8 storage centers. It also provides for the use of a standard
9 television receiver for video and audio, and contemporary
10 input devices to interact with the software program,
11 including video games. A bi-directional telephone link is
12 established between the home computing element and a remote
13 game storage center to access the desired game, and a
14 television broadcast channel used uni-directionally to
15 transmit the game software programs.

16 Much is known about video gaming devices for the home.
17 Presently, all require non-volatile game cartridges to store
18 the game software programs, and use known color graphics
19 circuits along with synthesized audio techniques. Game
20 cartridges are relatively expensive to purchase, and once
21 they are used for some time, they are used rarely thereafter.
22 This has led to the proliferation of video game rental
23 outlets as individuals express that they would rather have
24 variety than ownership, and would also rather make a shorter
25 and less expensive commitment.

26 Prior art patents representing known communication or
27 subscriber systems are represented in the U.S. Patent
28 4,829,372 to McCalley wherein a digital, interactive
29 communication system is accessible to a plurality of
30 subscribers who can select any of a plurality of pre-recorded
 video/audio presentations for viewing on a conventional

1 television set. The system includes a converter tuned to a
2 channel for monitoring a digital stream of information
3 including digital packets representative of video/audio
4 presentations selected by the individual subscribers. A
5 subscriber is housed within the apparatus supplied the
6 individual subscriber and the subscriber server receiving
7 uniquely addressed digital packets converts the received
8 packets into NTSC-compatible analog formatted video/audio
9 presentation for transmission to the requesting subscriber.

10 In addition, Abraham, 4,567,512 and 4,590,516, discloses
11 a system controlled through conventional telephone networking
12 in conjunction with a home controller that contains a
13 micro-processor and incorporating a telephone interface which
14 allows a subscriber to request a given program which is
15 available on a pre-scheduled time basis. Abraham does not
16 disclose digital transmissions. In addition, Abraham
17 discloses in U.S. Patent 4,521,806 signal traffic paths being
18 established for telephone communication and cable program
19 transmission in a basic subscription broadcast system. The
20 program material is stored at a library broadcast station in
21 analog form and is digitized and time compressed after
22 readout for transmission to the subscribers along the cable
23 paths.

24 Other patents demonstrating the prior art of the same
25 subject matter include Pocock et al., 4,734,764; Clark et
26 al., 4,761,684; and Gordon, 4,763,191.

27 In addition to the above, the U.S. Patent to Harrison,
28 4,584,603, discloses an amusement and information system for
29 use in a closed environment such as on airlines wherein an
30 entertainment terminal including a keyboard and video display
assembly is available for use by the occupant and is

1 structured to provide access to video games as well as movies
2 and other selected information.

3 Although it is well known to use a bi-directional
4 telephone link, as evidenced by the above-noted patents, to
5 access audio and video information that is transmitted as a
6 related but independent television broadcast channel, it is
7 apparent that a need exists for the transmission of
8 executable computer software program code representing video
9 games using a television broadcast channel to reach a
10 plurality of subscribers and act upon individual requests.

11 It is an object of this invention to provide a vehicle
12 whereby a plurality of video game software programs are made
13 available substantially upon demand and upon request to
14 individual subscribers on a "pay-per-play" basis with a
15 minimum of subscriber overhead. Another object is to provide
16 a home computing element that provides the means to utilize
17 said software programs, including video games, from within
18 the residence and under subscriber control using contemporary
19 game control devices.

20 21 Summary of the Invention

22 In accordance with the system of the present invention,
23 any of a plurality of individual subscribers may request a
24 video game stored in a software program library at a remote
25 location utilizing a home computing element or assembly to
26 establish a bi-directional telephone communication link with
27 a remote game storage center to access the services offered.
28 The remote game storage center acknowledges the request and
29 establishes a bi-directional channel of communications. The
30 home computing element transmits a unique identification
code, the game select code, the existence of a previously

1 loaded game software program and any mode commands. During
2 this time, the display on the home computing element shows
3 the status of the operation in progress. If the
4 homecomputing element cannot establish communications with
5 the remote game storage center, it will retry several times
6 before dropping the line and indicating a failed
7 communication attempt to the subscriber.

8 While maintaining communications with the home computing
9 element, the remote game storage center logs the time,
10 telephone number, identification code, the operating mode
11 and the desired game selection of the requesting home
12 computing element. If the selected game is already resident
13 in the home computing element, the remote game storage center
14 transmits an authorization code to the home computing element
15 effectively enabling the software program, and drops the
16 telephone line. A game software program is not transmitted
17 in this case, but if the selection is not in the home
18 computing element memory, the remote game storage center
19 transmits the encoded video game software program and the
20 home computing element identification code as a digital bit
21 stream of information over a television broadcast channel.
22 The telephone line is maintained active until all tasks have
23 been completed.

24 The home computing element requesting the game may
25 receive the video game software program only after
26 identification code validation occurs. This prevents
27 unauthorized use by others. Once reception of all the
28 software data has been successfully completed, the home
29 computing element acknowledges receipt to the remote game
30 storage center and drops the telephone line. The encoded
software program is decoded and is enabled to be used. The

1 subscriber is told through the display that the game is ready
2 for use. All of these actions occur in a very short period
3 of time.

4 The home computing element offers the subscriber the
5 means to interact with the game using contemporary gaming
6 control or input devices. The game may be played as many
7 times as desired. Each time the subscriber restarts the
8 game, a telephone link is established with the remote game
9 storage center for billing and authorization for use before
10 the game may be used. The software program remains in memory
11 until either power is removed or a new software program is
12 loaded. Even though a program may be resident within the
13 home computing element, its use is restricted unless
14 authorization is issued by the remote game storage center.
15 The remote game storage center always maintains an activity
16 log for each subscriber which is used for billing.

17

18 Brief Description of the Drawings

19 For a fuller understanding of the nature of the present
20 invention, reference should be had to the following detailed
21 description taken in connection with the accompanying
22 drawings in which:

23 Figure 1 is a system level block diagram depicting a
24 digital interactive communication system in conjunction with
25 a home computing assembly of the present invention.

26 Figure 2 is a front view of one preferred embodiment of
27 the home computing assembly as represented in block diagram
28 in Figure 1.

29 Figure 3 is a detailed functional block diagram of the
30 home computing assembly shown in Figure 2.

Figure 4 is a functional block diagram of one embodiment
of a remote game storage center of the present invention.

1 Figure 5 is a flow chart depicting the operational logic
2 encompassing the remote game storage center of Figure 4.

3 Figure 6 is a flow chart that relates the tasks
4 performed by a home computing assembly executive program.

5 Figure 7 is a flow chart showing the functional aspects
6 of a command processor defined as part of the home computing
7 assembly shown in Figure 2.

8 Figure 8 is a flow chart of the dial-up routine "DIAL"
9 which is invoked by the command processor whose flow chart is
10 shown in Figure 7.

11 Figure 9 is a continuation of the flow chart shown in
12 Figure 8.

13 Figure 10 is a flow chart of the functions performed by
14 the game storage card programming routine "PROG" which is
15 invoked by the command processor whose flow chart is shown in
16 Figure 7.

17 Figure 11 is a flow chart of the reset game routine
18 "RST" which is invoked by the command processor whose flow
19 chart is shown in Figure 7.

20 Figure 12 is a flow chart of the start game routine
21 "STRT" which is invoked by the command processor whose flow
22 chart is shown in Figure 7.

23

24 Description of the Preferred Embodiment

25 Referring to Figure 1, the preferred embodiment of the
26 present invention comprises a system including a plurality of
27 remote game storage centers 60 which communicate with a
28 plurality of subscriber locations indicated as such. Each of
29 the subscriber locations includes a home computing assembly
30 or element 10, a standard television receiver 23 and one or
 more gaming control devices 12. A digital interactive

1 communications environment is established using a plurality
2 of voice quality telephone lines 74 and a television
3 broadcast facility 92 such as a CATV network, defined in
4 Figure 1 as cable head end which is lined to the home
5 subscriber facility and more particularly, the home computing
6 element as at 71. It should be noted that the telephone
7 lines 74 connect directly the remote game storage center 60
8 with the home computing element 10 and also connect the
9 remote game storage center with a headquarters 90, to be
10 described in greater detail hereinafter.

11 The subscriber utilizes the home computing element 10 to
12 call the remote game storage center 60 through the telephone
13 line 74. Once the link is established, the subscriber may
14 select any one of a plurality of pre-stored video games or
15 like software programs previously provided to the subscriber
16 by any type of pre-available menu. The selection is made by
17 pressing the appropriate keys as at 24 on the home computing
18 element 10 as set forth in greater detail in Figure 2. The
19 software program representing the selected video game is
20 retrieved from a permanent storage library by a computer
21 facility at the remote game storage center 60 and transmitted
22 typically to a CATV head 92 as an encoded stream of digital
23 data in NTSC compatible format as at 70. The signal is then
24 broadcast through the CATV network along with pre-recorded
25 video programming to all cable subscribers. All cable
26 subscribers may view the pre-recorded video programming
27 portion. However, only the specifically requesting
28 subscriber locations or home installations containing the
29 requesting home computing element 10 can receive, decode and
30 use the video game software programs which have been
selected.

1 The RF video signal is received from the distribution
2 cable 71, is processed and the resulting, decoded software
3 program stored by the HCE 10 and is then enabled for use by
4 the subscriber in conjunction with display at the
5 conventional television receiver 73. The desired gaming
6 control facilities as at 12 are also usable for subscriber
7 interaction with the video game software program.

8 All billing for use of the subscribed video games is
9 performed automatically by the computer facilities of the
10 remote game storage center 60 and the information is
11 transmitted over the telephone lines 74 to the main office or
12 headquarters 90 (see Fig. 1). The headquarters 90 may also
13 request other specific information such as but not limited to
14 diagnostic test results from the remote game storage center
15 60 and may send commands and/or software programs that may be
16 executed by the computer facilities maintained within the
17 remote game storage center 60.

18 Again with reference to Figure 2, a preferred embodiment
19 of the home computing element or assembly 10 encompasses an
20 alphanumeric display 13 to demonstrate or display messages.
21 In addition, a keyboard for subscriber interaction, for
22 example, to enter game selection and commands are represented
23 and includes numerical keys collectively referred to as 24.
24 In addition, commands may be entered into the system by use
25 and considered a part of the home computing element 10.

26 In operation, the subscriber first uses the numeric
27 keypad 15 further utilizing any of the numerical keys to
28 enter the code number for the video game programs selected
29 off the aforementioned published menu previously provided.
30 The clear key 16 is used to correct any data entry errors.
Once the entire number is entered the enter key 17 is pressed

1 and the home computing element 10 responds by displaying the
2 selections on the display 13. The dial key 18 is then
3 pressed to call the remote game storage center 60 and
4 transmit the proper home computing element 10 identification
5 code and game selection number one by virtue of telephone
6 line 74. The game software program is received by the home
7 computing element 10 where it is decoded and stored. The
8 display 13 indicates that a game is loaded and ready for play.
9 The game is started by pressing the start key 23 and paused
10 at any time by pressing the appropriate pause key 22.
11 Pressing this key again serves to restart the game. The
12 TV/game key 21 may be pressed to switch to view standard
13 programming on the television receiver 73 overriding the game
14 display and audio.

15 The video game software program may be permanently
16 stored in a removable, non-volatile memory card 25 by
17 ensuring that a card is placed in the side slot as appears in
18 Figure 2. A one time purchase charge will be billed, but the
19 game may be played as often as subscriber likes using the
20 card 25 without incurring additional costs.

21 Referring to Figures 5 through 12; Figure 5 demonstrates
22 a flow chart depicting the operational logic encompassing the
23 remote game storage center. Figure 6 is a flow chart
24 demonstrating the task performed by an executive program
25 encompassed within the home computing element 10.

26 Figure 7 is a flow chart showing the functional aspects
27 of a command processor defining a portion of the home
28 computing element 10 shown in detail in Figure 2. Figure 8
29 and Figure 9 is a flow chart of a dial-up routine (DIAL)
30 which is invoked by the command processor (Fig. 7) of the
home computing element 10.

1 Figure 10 is a flow chart demonstrating the functions
2 performed by the game storage card 25 programming routine
3 (PROG) which is invoked by the command processor (Fig. 7) of
4 the home computing element of Figure 2. Figure 11 is a flow
5 chart of a reset game routine (RST) which is invoked by the
6 command processor whose flow chart is shown in Figure 7.

7 Figure 12 is a flow chart demonstrating the start game
8 routine (STRT) invoked by the command processor (Fig. 7) of
9 the home computing element 10.

10 Figure 3 is a detailed, internal block diagram which
11 shows all of the major circuits contained in the home
12 computing element 10. The home computing element 10 is based
13 on a micro-processing unit 30 which acts as the overall
14 controller. The micro-computer 30 operates as dictated by
15 the executive program which is stored in the ROM 31. The
16 flow charts as set forth in Figures 5 through 12 and as
17 explained in greater detail above illustrate the operations
18 related to the executive program in more specific detail.
19 Data areas required by the executive and external program
20 areas reserved for the use of downloaded video game software
21 programs reside in random access memory (RAM) 32. The memory
22 areas in RAM are volatile and will lose their contents if
23 power is removed, therefore, an electrically erasable
24 programmable read only memory (EEPROM) 33 provides
25 non-volatile storage for such data as the telephone number of
26 the remote game storage center 60 serving the subscriber, the
27 home computing element 10 identification code, and other
28 information that must be retained if power is lost.

29 As shown in Figure 3, several circuits are provided to
30 interface the micro-controller or micro-processor unit 30 to
the outside world referred to herein as peripheral devices.

1 A telephone link is provided by a universal asynchronous
2 receiver/transmitter (UART) 34 whose digital output keys two
3 distinct audio tones that are transmitted to the telephone
4 line, along with "hand-shaking" information by a modem
5 interface 35. The modulated outputs are transformer coupled
6 to the telephone line 79. All telephone communications,
7 including automatic dial-up are handled by the
8 micro-processing unit 30 utilizing this circuitry.

9 The keyboard 42 status is read by the micro-processing
10 unit 30 through a peripheral interface adapter 40 which is
11 capable of interfacing with digital inputs and outputs only.
12 A contact based game control adapter is interfaced to the
13 micro-processing unit 30 through the peripheral interface
14 adapter 40, but potentiometer based input devices, such as
15 some joy-sticks and trackballs, are interfaced through an
16 analog to digital converter (ADC) 39 which is capable of
17 converting the analog signals provided by the input device to
18 their numeric or binary representations required by the
19 micro-processing unit 30. The display module 13 (see also
20 Figure 2) containing the internal electronics necessary to
21 display alpha/numeric characters, interfaces directly to the
22 micro-processing unit 30 data bus 50. The display is where
23 all the system status messages are displayed to the
24 subscriber.

25 Again with reference to Figure 3, the incoming broadcast
26 channel 51 is monitored for game software programs. The
27 signal is demodulated by an RF demodulator 36 and then passed
28 to a digital signal processor 37 which samples the signal,
29 converts it to digital data, processes the information and
30 then makes it available to the micro-processing unit 30. The
digital signal processor 37 is a single-chip computer

1 tailored to the task of obtaining a digital representation of
2 analog signals and digital processing at a very fast rate;
3 currently up to 33 million operations per second. The
4 digital signal processor 37 acts as a co-processor operating
5 under the control of its own custom software program written
6 in a machine specific computer language.

7 The NTSC compatible signal 52 that is ultimately
8 connected to the television receiver 73 contains all of the
9 video and audio information associated with the game. the
10 video is generated by the graphics generator circuit 45 which
11 is itself another co-processor, while the sound generator 44
12 creates all of the audio and is directly controlled by the
13 micro-processing unit 30. The output signals are used to
14 modulate carriers with the video 47 and audio 46 modulators
15 and then mixed with a RF combiner 48 whose output is a NTSC
16 compatible television signal 52 that drives the television
17 receiver 73. The TV/GAME relay 49 is controlled by the
18 micro-processing unit 30 and connects the output of the
19 combiner 52 to the video output jack. The relay 49 responds
20 to the activity of the TV/GAME key 21 as an alternate action
21 device.

22 With reference to Figure 4, the remote game stored
23 center 60 (Fig. 1) includes a thirty-two bit desk top
24 computer 61 to perform all required processing, storage and
25 control functions. Storage for the dedicated and game
26 software is provided by a hard disk 63 with fast access times.
27 The computer 61 is initially loaded from the magnetic tape
28 cartridge drive 64 by a utility invoked from the 1.44
29 megabyte floppy drive 62 containing the appropriate disk.
30 The utility reads the software programs from the tape drive
64 and stores it on the hard disk 63 for fast, random access

1 of files. The flow chart illustrating the major tasks
2 performed by the executive program of the remote game stored
3 center 60 is shown in Figure 5.

4 The computer 61 is also responsible for controlling
5 telephone access to resident services. A plurality of
6 telephone lines 79 are routed by a telephone switching
7 controller 67 to several modems 66 which convert the FSK
8 telephone signals 80 to RS-232 digital, serial data 81. This
9 data is read and buffered by a RS-232 multiplexer/buffer 65
10 which allows high speed data transfers through a parallel
11 interface 87 to serve a large plurality of modems 66. These
12 are all bi-directional data paths allowing the computer 61 to
13 receive and transmit data through the telephone. The
14 computer 61 responds to different messages from the
15 subscriber and other messages from the main office or
16 headquarters dealing with game selections to be broadcast,
17 types of service being provided, diagnostic test results, and
18 billing information and other relevant information requests
19 or command messages.

20 The last major task performed by the remote game storage
21 center 60, computer 61 is the transmission of the game
22 software programs that will ultimately execute in a home
23 computing element 10. The software is output by the computer
24 61 as a digital bit stream 85 which is modulated and mixed
25 with the signal coming from the video cassette
26 recorder/player (VCR) 68, or other broadcast source by an RF
27 modulator 69. The resulting output 70 is then typically
28 delivered to a CATV head end 92 for distribution. The VCR 68
29 contains standard pre-recorded programming for broadcast, and
30 is controlled by the computer 61 through a series of control
lines 83.

1 It is therefore to be understood that the following
2 claims are intended to cover all the generic and specific
3 features of the invention herein described, and all
4 statements of the scope of the invention which as a matter of
5 language, might be said to fall therebetween.

6 Now that the invention has been described,
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1 What is claimed is:

2 1. A bi-directional, interactive communications system
3 for transmitting in a digital format, software programs
4 including video games from a remote storage center to a
5 plurality of subscriber locations on demand, said system
6 comprising:

7 a) a home computing assembly disposed at each
8 subscriber location and connected by telephone lines to the
9 remote storage center and linked to a television broadcast
10 facility,

11 b) each of said home computer assemblies
12 structured to receive individually addressed data from the
13 remote storage center and including decoder means tuned to a
14 television broadcast channel for monitoring the digital
15 streams of data representing the computer software programs
16 and means for detecting the proper identification codes of
17 said requesting subscribers,

18 c) each of said home computer assemblies including
19 digital processing means for receiving the digital streams of
20 data to be executed as software programs by the requesting
21 ones of said home computing elements, and means for
22 subscriber identification, and

23 d) each of said home computer assemblies further
24 including distributed computer processing means for invoking
25 the software programs to perform the task associated with
26 said software programs and means to interact with said
27 software programs.

28 2. A system as in Claim 1 wherein each of said home
29 computing assemblies are defined as a remote slave computers
30 within a wide area network and includes means of transferring
 software programs through a television broadcast channel.

1 3. A system as in Claim 1 wherein each home computing
2 assembly is tuned to a television broadcast channel and
3 includes means for detecting, receiving, decoding,
4 formatting, storing and executing software programs from the
5 television broadcast channel.

6 4. A system as in Claim 1 further comprising a
7 standard television receiver and a game control assembly
8 located at each subscriber location and each being connected
9 to a corresponding home processing assembly, the software
10 program being loaded from the television broadcast channel
11 thereby eliminating the need for ancillary, non-volatile game
12 storage devices.

13 5. A system as in Claim 1 wherein each of said home
14 computing assemblies are structured to accomplish independent
15 control of the television video and audio locally at the
16 subscriber location, whereby control of video and audio
17 signals is not accomplished at the originating television
18 broadcast facility.

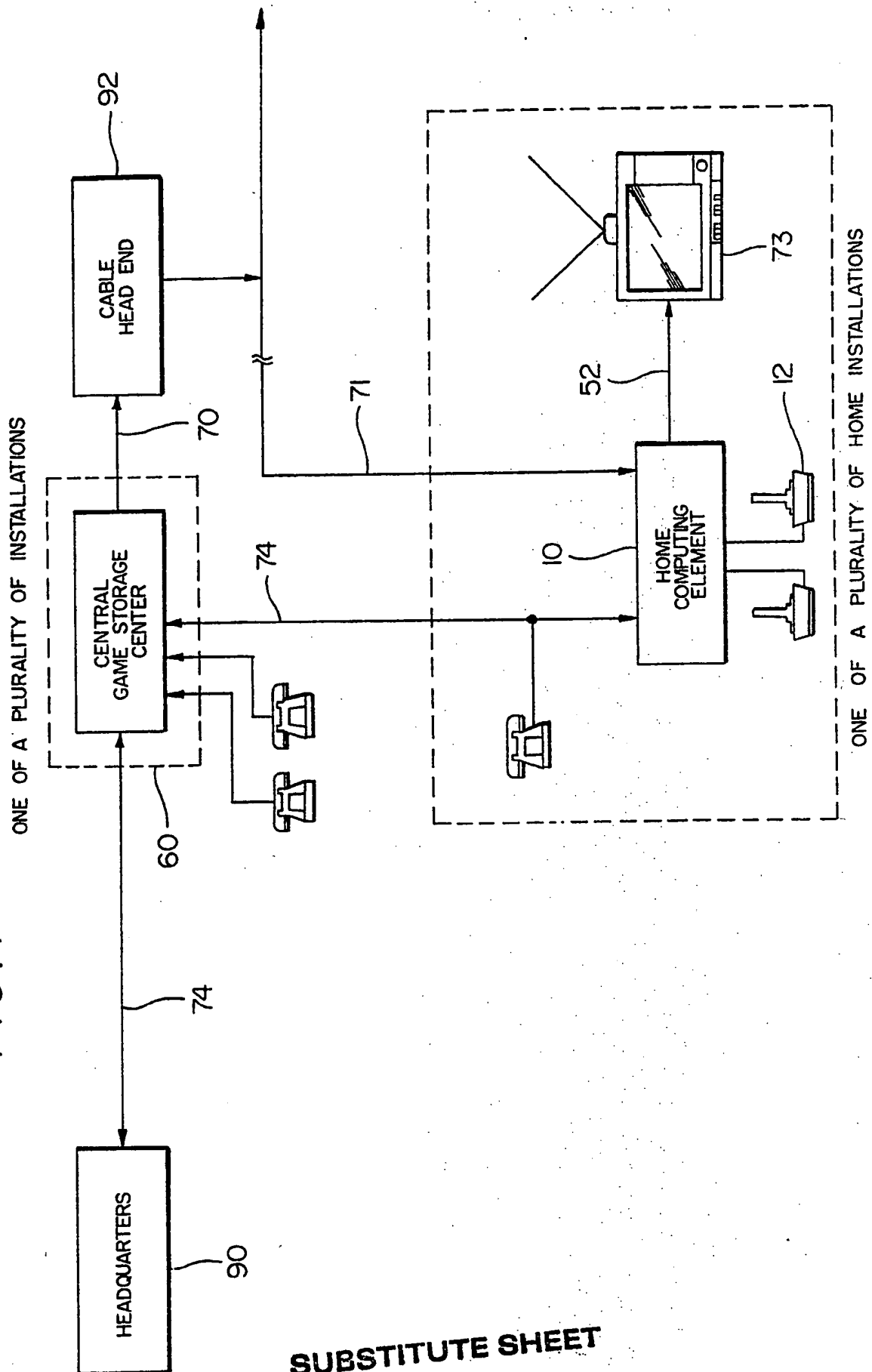
19 6. A system as in Claim 1 wherein each of said home
20 computing assemblies include a memory programmer means for
21 permanently recording the software program resident in RAM
22 memory on a non-volatile game storage device such as a
23 programmable memory medium for re-use.

24 7. A system as in Claim 1 wherein said remote storage
25 center comprises a self-test diagnostic capability means for
26 allowing access to a fault history map used to isolate
27 malfunctions of system, components, telephone links or
28 television broadcast channels, on demand.

29 8. A system as in Claim 1 further comprising an
30 adaptive billing sub-system being computer based and capable
of tracking subscriber activity.

1/12

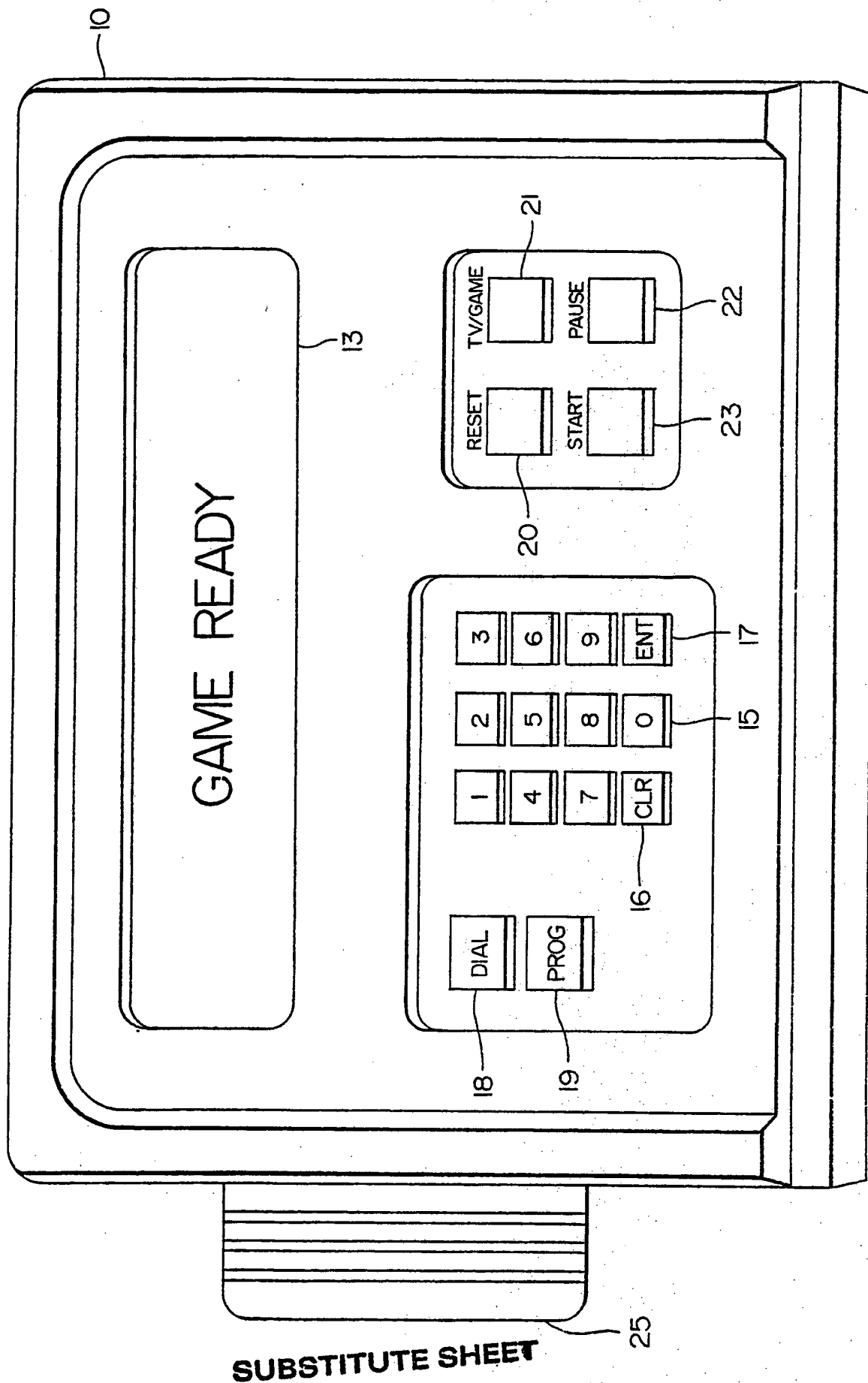
FIG. 1



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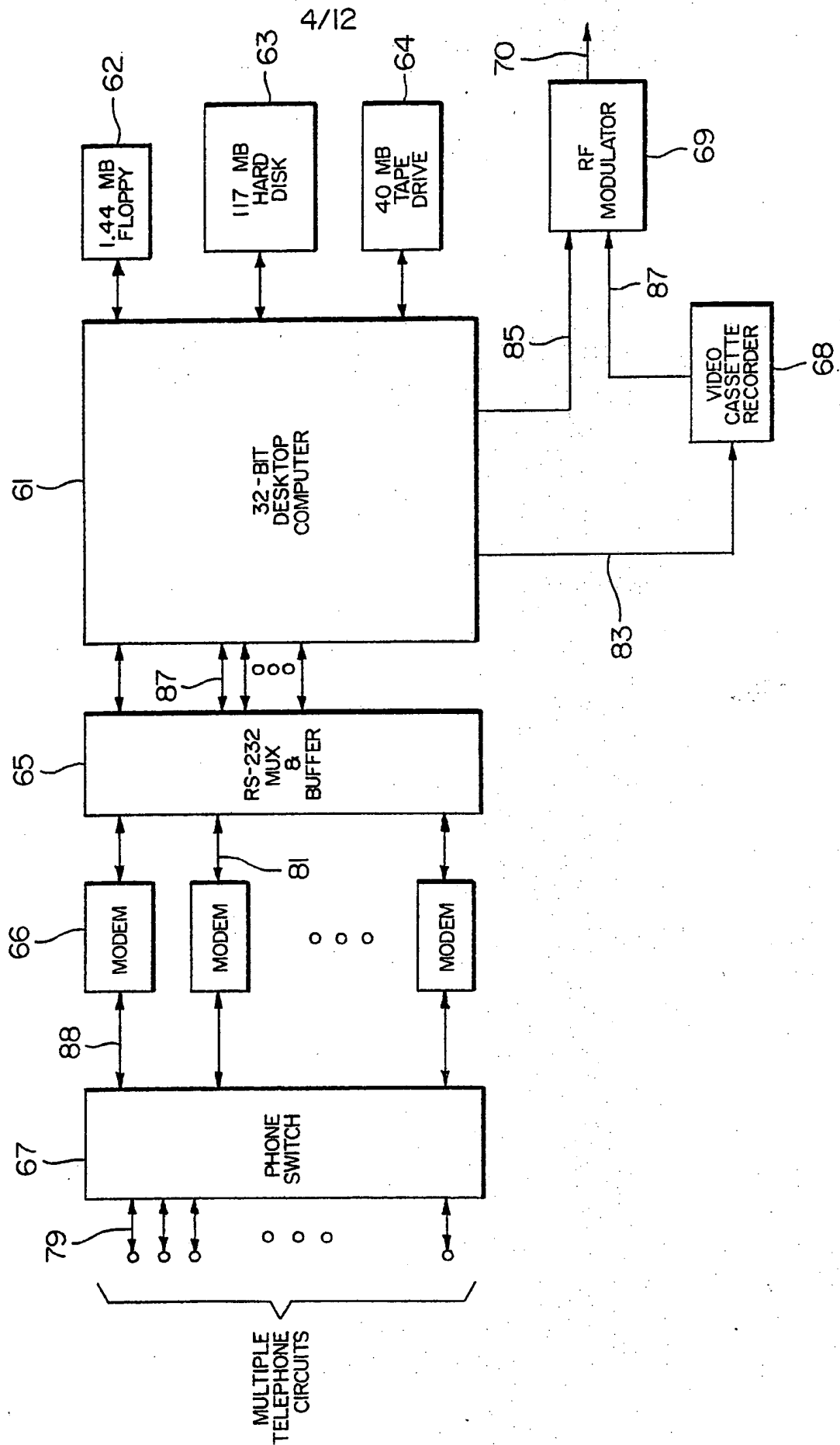
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FIG. 2



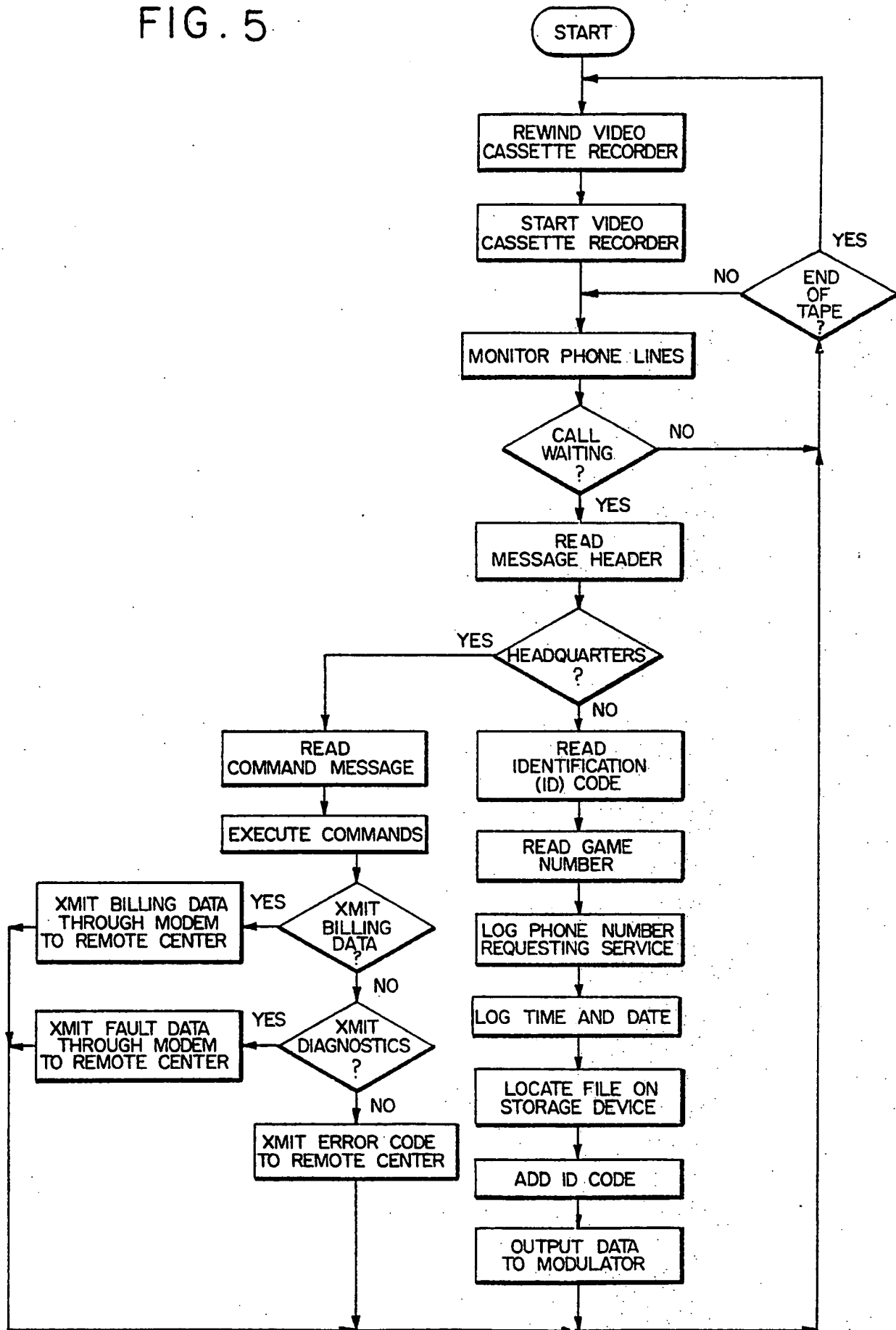
SUBSTITUTE SHEET

FIG. 4



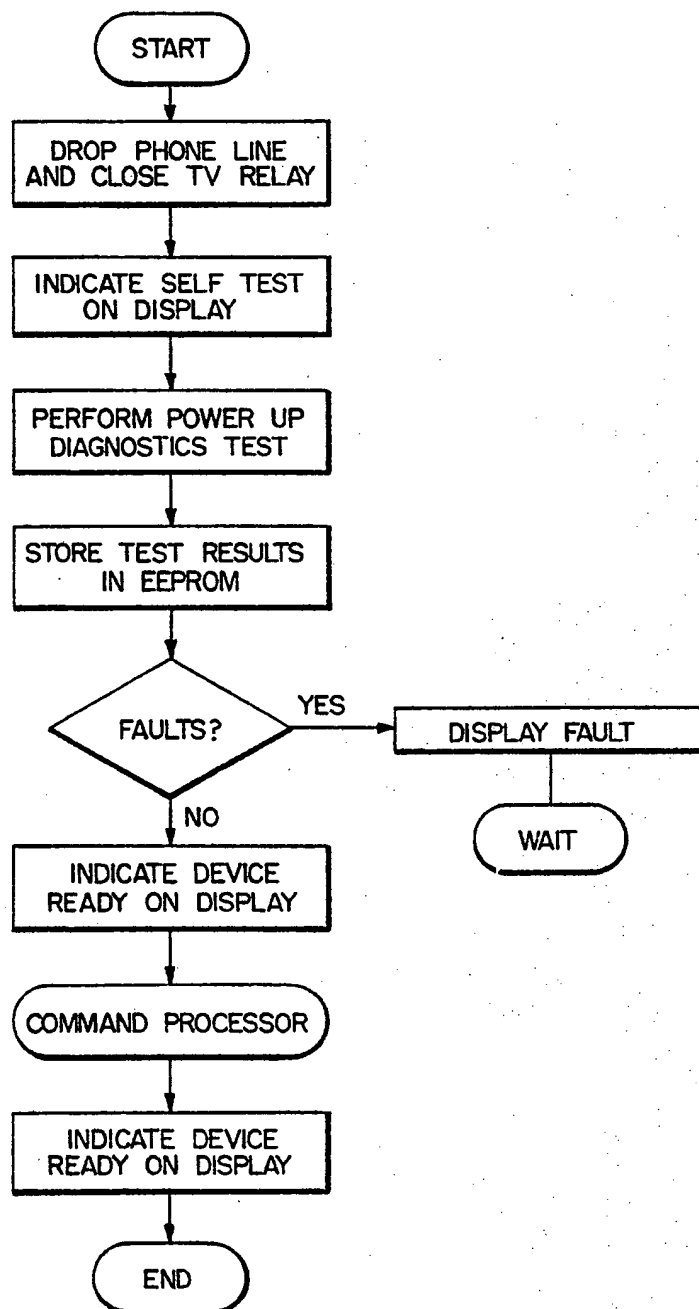
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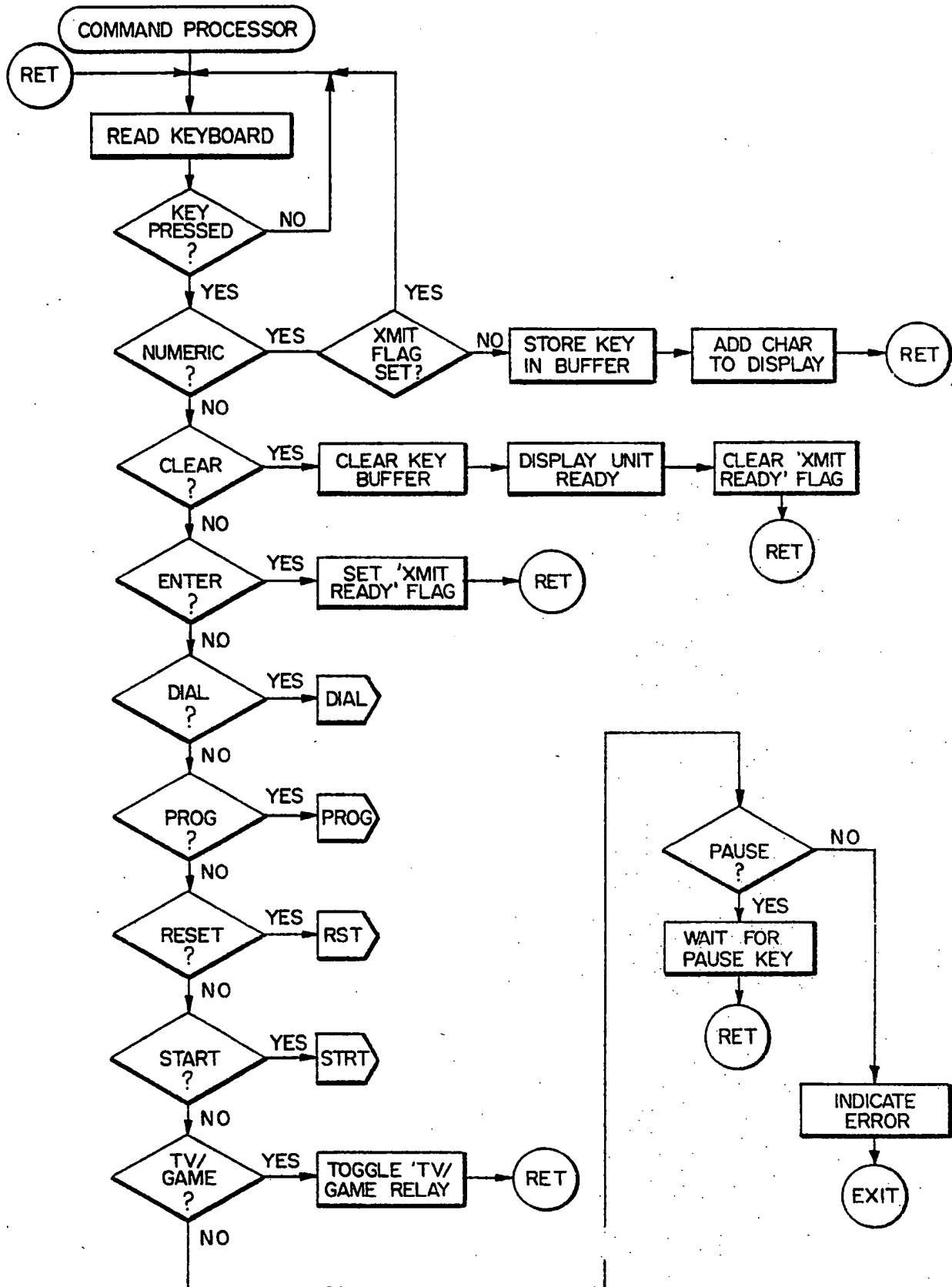
FIG. 5



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FIG. 6

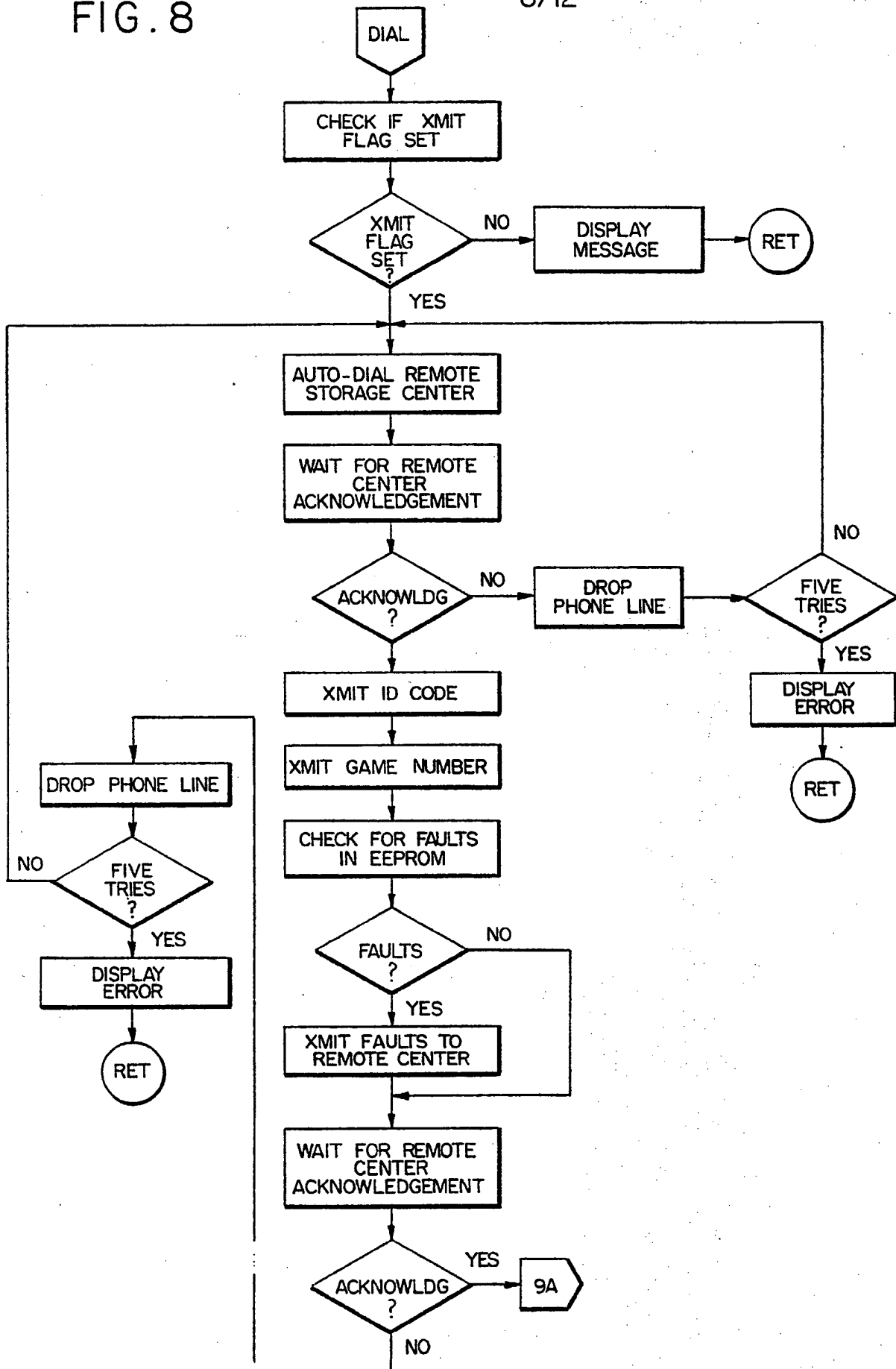


7/12
FIG. 7

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FIG. 8

8/12



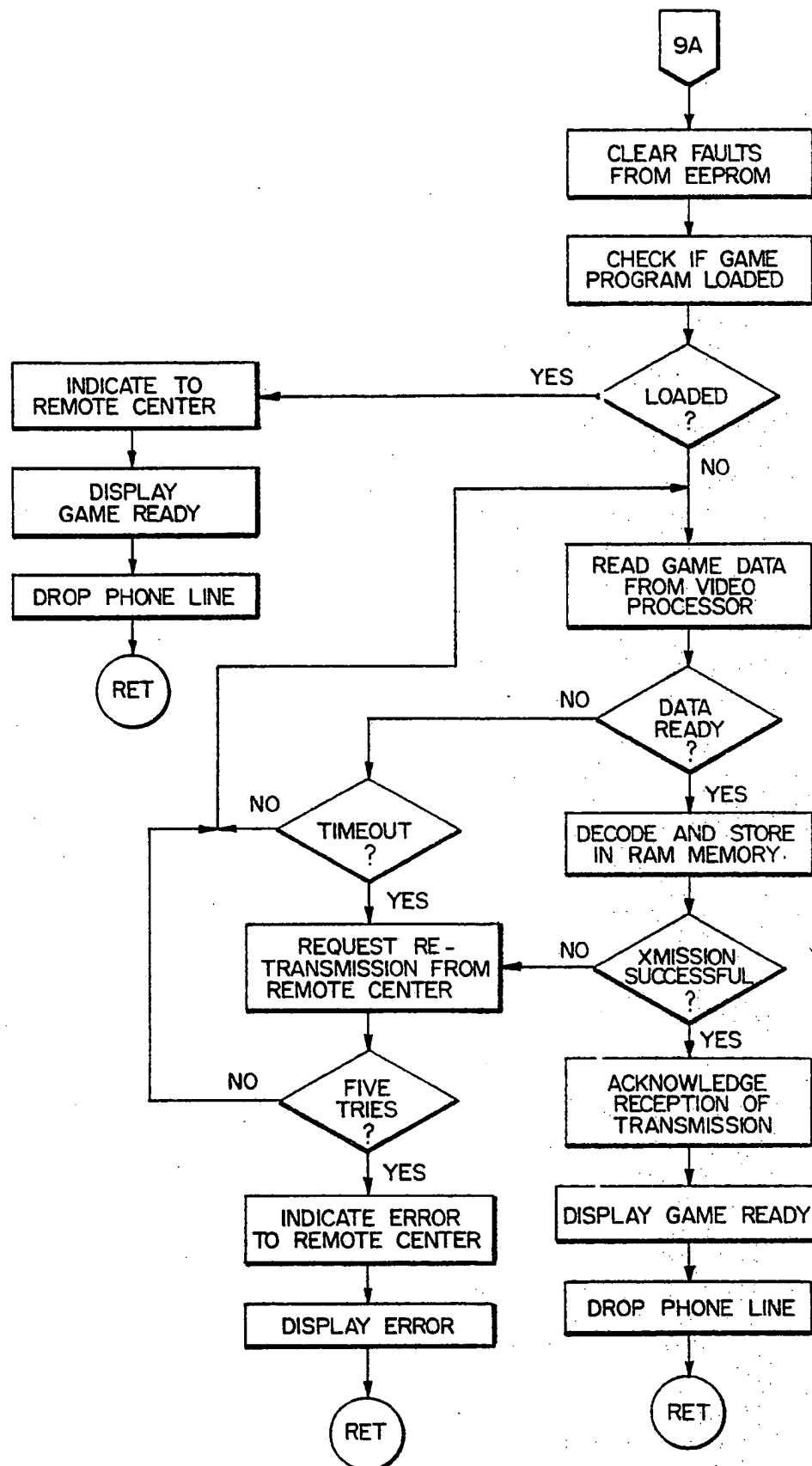
9/12
FIG. 9

FIG. 10

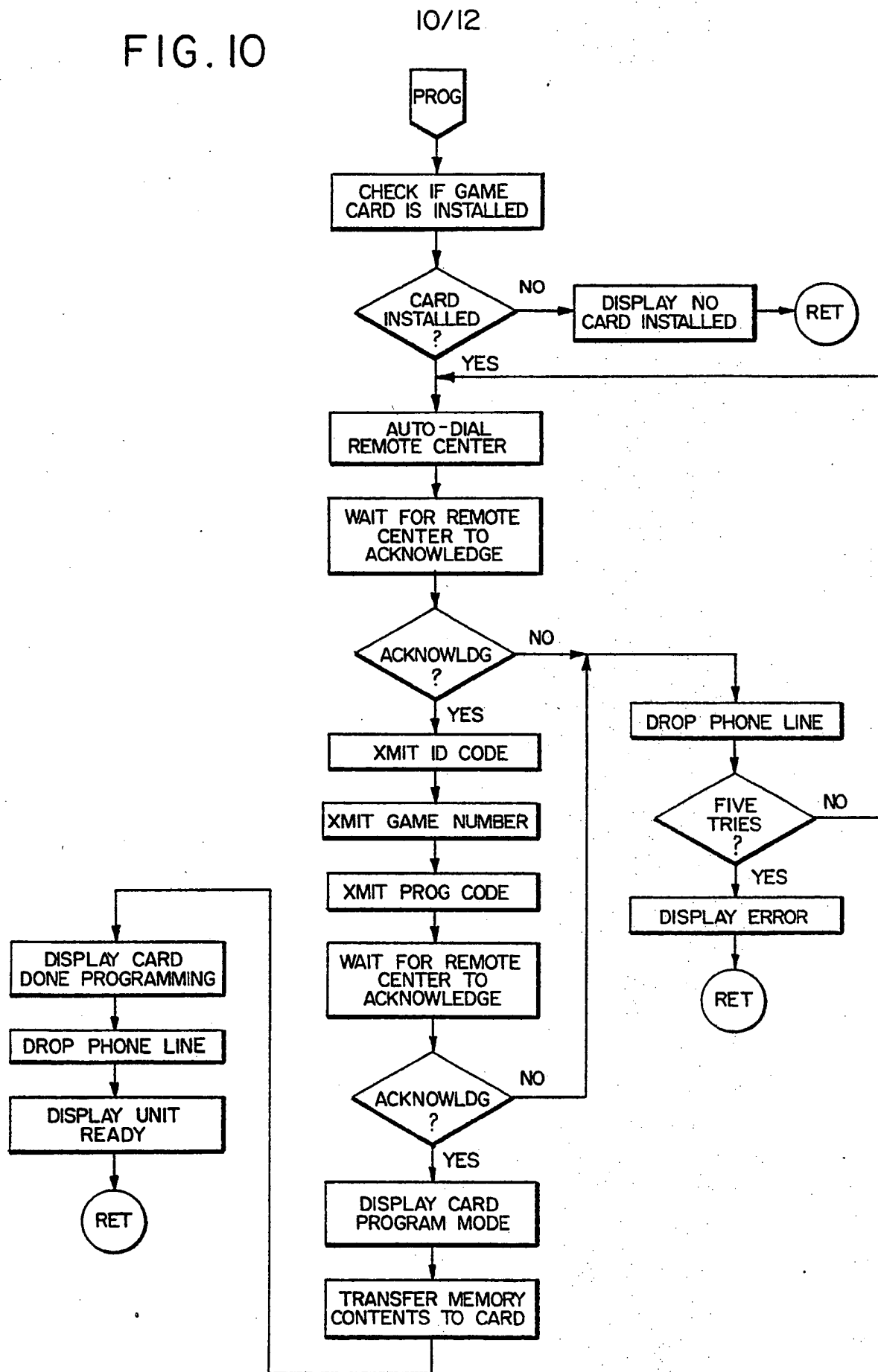
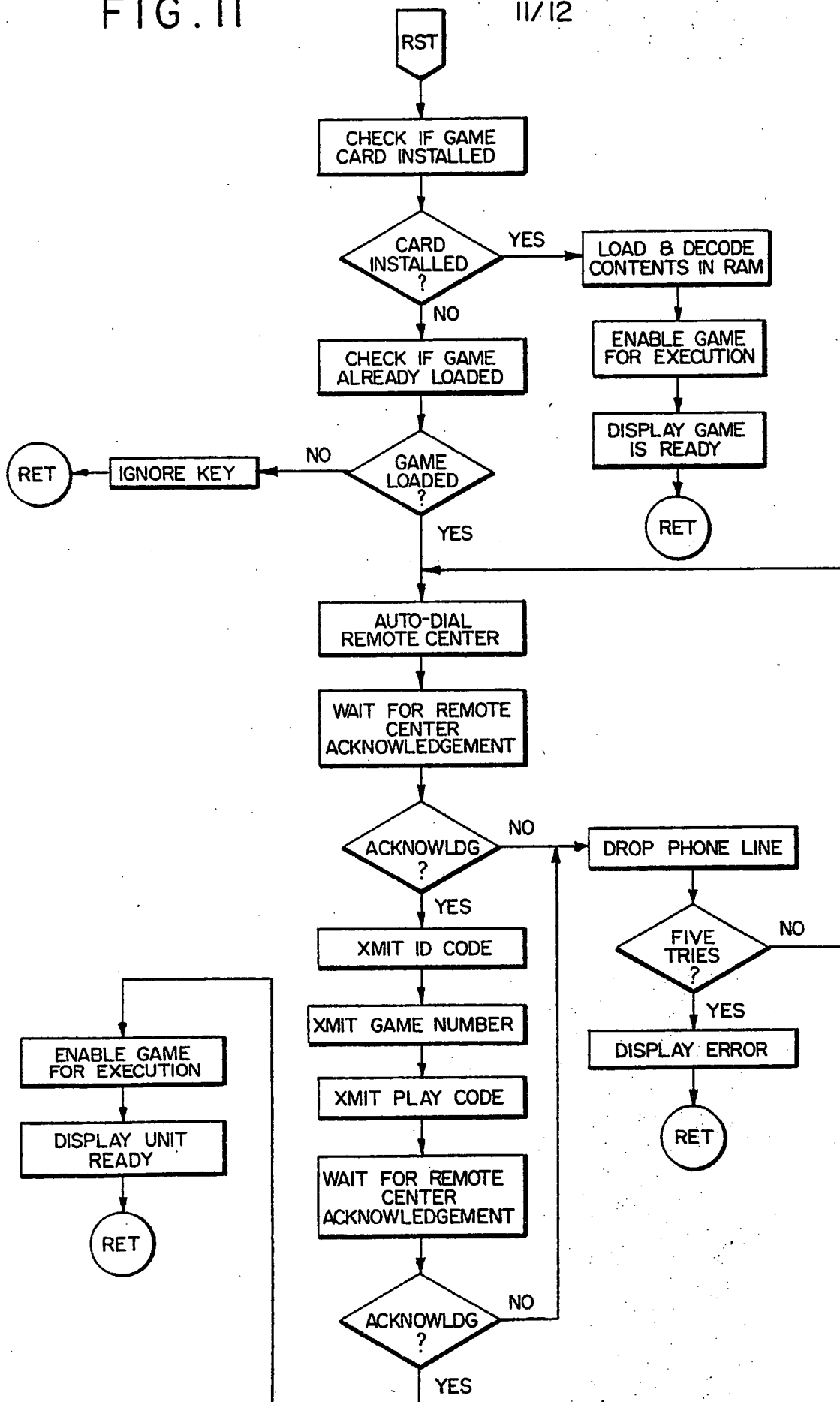


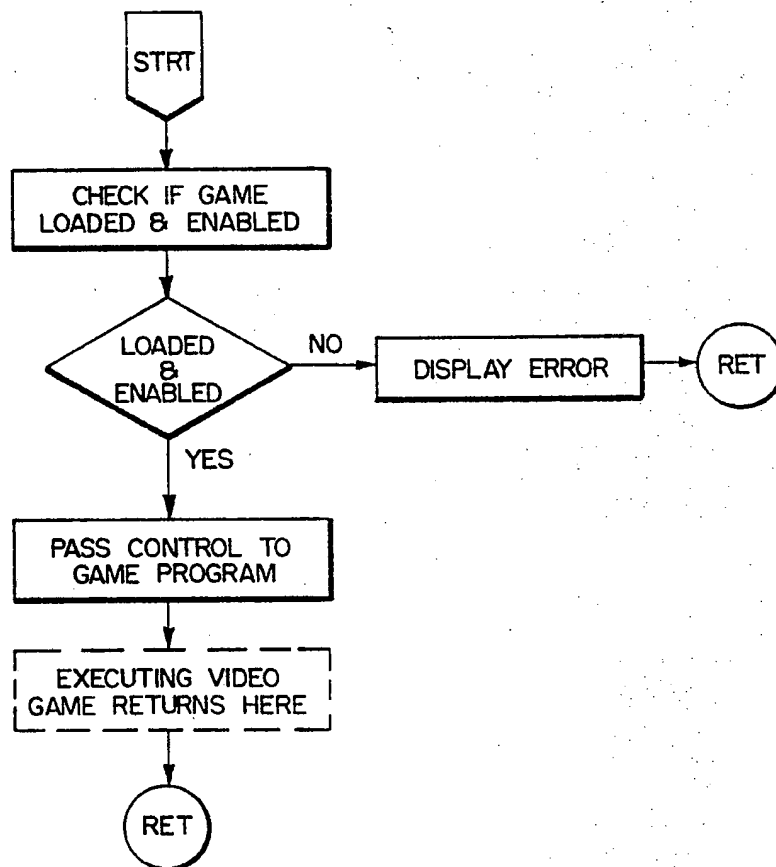
FIG. 11

11/12



12/12

FIG. 12



INTERNATIONAL SEARCH REPORT

International Application No. **PCT/US90/05850**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC (5): HO4H 1/02; HO4N 7/10		
U.S.CL.: 455/3, 4, 5; 358/86		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
U.S.	455/ 3, 4, 5, 358/ 84, 86, 114	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
Y	US, A, 4,506,387 (WALTER) 19 March 1985 See entire document	1-8
Y	US, A, 4,623,920 (DUFRESNE ET AL) 18 November 1986 See entire document	1-8
Y	US, A, 4,866,515 (TAGAWA ET AL) 12 September 1989 See entire document	1-8
Y, P	US, A, 4,890,320 (MONSLOW ET AL) 26 December 1989 See entire document.	8
Y	US, A, 4,677,685 (KURISU) 30 June 1987 See figure 1	3
<p>* Special categories of cited documents: ¹⁵</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ¹	Date of Mailing of this International Search Report ²	
09 JANUARY 1990	20 FEB 1991	
International Searching Authority ¹	Signature of Authorized Official ¹⁹	
ISA/US	LISA D. CHARQUEL <i>Lisa D. Charquel</i> Nguyen HOC-HO INTERNATIONAL DIVISION <i>Nguyen HOC-HO</i>	

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y

US, A, 4,580,161 (PETRUS ET AL) 01 April 1986
See entire document

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V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE¹

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers _____, because they relate to subject matter¹ not required to be searched by this Authority, namely:
2. ☐ Claim numbers _____, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out¹, specifically:
3. ☐ Claim numbers _____, because they are dependent claims not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING²

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.